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A new species of cardinalfish (Apogonidae) from the Philippines, with comments on species of *Apogon* with six first dorsal spines

Thomas H. Fraser

W. Dexter Bender and Associates, Inc., 2052 Virginia Avenue, Fort Myers, Florida 33901, U.S.A.

Abstract.—A new species of *Apogon* (*A. bryx*) from deep water is described from the Philippines. It is the sixth species with six first dorsal spines, a completely serrated preopercular edge, black stomach and intestine, pored lateral line scales from the posttemporal bone to the caudal fin and eight anal fin-rays. The new species is compared with other six-spined (first dorsal) species with these characters and a key is provided. One rare, deep-dwelling *Apogon* from the Philippines and two undescribed species from the Indian Ocean and West Pacific Ocean are briefly discussed in relation to the new species. Two species have identifiable synonyms: *Apogon gularis* (*Apogon smithvanizi*) and *Apogon thermalis* (*Apogon sangiensis*). *Apogon unicolor* is removed from the subgenus *Pristicon*.

A new species of *Apogon* from deep water is described from the Philippines. It is the sixth known six-spined species in *Apogon* with a completely serrated preopercular margin, pored lateral-line scales from posttemporal to base of caudal fin, black stomach and intestine, and eight anal fin-rays. This description, based on one specimen, is being provided because the unusual depth of the trawl collection makes it unlikely that more material will be available soon.

Six spines in the first dorsal fin and a completely serrated preopercular margin are found in relatively few species of the genus *Apogon*. The pan-tropical subgenus *Apogon*, with about 35 species, has the ventral portion of the preopercle unossified, as a thin fleshly flap, the vertical edge of the preopercle serrated, two supraneural bones, no free uroneurals, ctenoid scales, pored scales forming a complete lateral line, eight anal fin-rays, and the stomach and intestine pale. An apparently related pan-tropical subgenus, *Zapogon*, with two species, has a free pair of uroneurals, a black pigmented stomach and intestine, and is otherwise similar to the subgenus *Apogon*. Fraser (1972) included *Apogon trimaculatus* Cuvier *in* Cuvier & Valenciennes, 1828 and *Apogon unicolor* Döderlein *in* Jordan & Snyder, 1901 in the subgenus *Pristicon* based on three supraneural bones, a free pair of uroneurals, strongly serrated infraorbitals and preopercular ridge. *Apogon unicolor* is removed from *Pristicon* based on the presence of a ventral fleshy, unossified flap of the preopercle, small body scales and a black stomach and intestine. This species may represent another line within *Apogon*. The Atlantic Ocean subgenus *Paroncheilus*, with one species, has a partially ossified ventral preopercular edge, nine anal rays, some canine teeth, cycloid scales, and is otherwise similar to the subgenus *Apogon*.

The remaining species of *Apogon* with six first dorsal spines, have an ossified, serrated ventral preopercular edge. These species have been placed in various subgenera. The subgenera *Pristicon* (2 species), *Yarica* (1 species), and a few species of *Ostorhinchus* (those with six first dorsal spines at least 3 species: *Apogon nigripes, Apogon amboinensis* and *Apogon lateralis*) have pale stomachs and intestines. This small group of *Ostorhinchus* is under review by

Fig. 1. The holotype of *Apogon bryx*, 42.5 mm standard length, from the Philippines, Luzon Island, Batangas Province, Balayan Bay.

me. Other species of *Ostorhinchus* (at least 107 species) may either have stomachs and intestines pale, speckled or black pigmented. The subgenera *Brephamia* (2–3 species), and *Zoramia* (4 species) have a black pigmented stomachs and intestines. *Apogon nanus*, provisionally allocated by Allen et al. (1994) in *Brephamia* has pored lateral line scales extending from the posttemporal bone to the caudal fin unlike the other two species. The subgenus *Ostorhinchus* has species with six (about 10) or seven (at least 107) visible first dorsal spines.

Methods

Methods of taking and recording meristic data and measurements are given in Fraser & Lachner (1985). All measurements are in millimeters to the nearest 0.1 mm. All proportions are based on standard length and all material is reported by standard length rounded to the nearest millimeter, except for the primary type material. All x-ray photographs are in data files maintained by the author. The following acronyms are used to designate institutions and collections cited: BMNH Natural History Museum, London; BPBM Bernice P. Bishop Museum, Honolulu; CAS California Academy of Sciences, San Francisco; (SU) Stanford University (collections now housed at CAS); MNHN Museum National d'Histoire Naturelle, Paris; RMNH Nationaal Naturhistorisch Museum, Leiden; RUSI J. L. B. Smith Institute of Ichthyology, Grahamstown, South Africa; USNM collections of the former United States National Museum, deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C.

Apogon bryx, new species
Fig. 1

Material examined.—Holotype: *Apogon bryx* CAS 34408; (42.5); Philippines, Luzon Island, Batangus Province, Balayan Bay, south of Barrio Nonong Casto, in 146-155 m. J. E. Norton. 25 Jun 1966. x-rayed.

Comparative material.—*Apogon atrogaster* Holotype USNM 70249; (46.8); Philippine Is., Western Luzon; x-rayed. Paratypes USNM 163227; 7(35–48); same data as holotype; x-rayed. *Apogon gularis* Holotype USNM 225672; (36.1); Red Sea; x-rayed. *Apogon kiensis* Holotype SU 6514; (56.9); Japan, Wakanoura Kii; x-rayed. Paratypes SU 6739; 21(47–59) same data as holotype. USNM 71232; 13(30–60); Japan, Shimizu; x-rayed. *Apogon* sp., cf. *kiensis* RUSI 3075; (39–43); Mozambique; x-

rayed. RUSI 3074; (31); Mozamibque; x-rayed. RUSI 3073; (44–46); Mozambique, x-rayed. *Apogon nanus* Paratype USNM 328635; (28); Malaysia, Sabah. *Apogon nigripes* Syntypes BMNH 1864. 11.15.72-74; (37.3), 1865.2.2.23; (42.3); Zanzibar. *Apogon sangiensis* Holotype RMNH 5577; (63.7); Indonesia, Sangi I. *Apogon smithvanizi* Paratypes USNM 331174; (46); Bahrain. BPBM 36421; (49); Bahrain. *Apogon thermalis* Holotype MNHN 8686; (54.7); Sri Lanka, Trincomalee. *Apogon unicolor* Holotype USNM 49708; (59.6); x-rayed. Japan, Yokohama. USNM 173833; (85); Australia, NW Cape Arnhem. *Apogon* sp. USNM 349036; (42); Philippines, Palawan, Puerto Princesa. USNM 260920; (71); Fiji, Lau Group, Matuku Island (19°9′38″S, 179°45′23″E). USNM 260921; 2(49–72); Fiji, Charybdis Reef (17°12′S, 178°0′E).

Diagnosis.—An *Apogon* in the subgenus *Ostorhinchus* with six first dorsal spines, a completely serrated preopercular edge, black stomach and intestine, eight anal fin-rays, 14–15 pectoral fin-rays, 22 gill rakers (including rudiments) on first arch, no dark stripes or spots on the head, body or fins.

Description.—For general body shape see Fig. 1. Proportional measurements (as percentages of standard length, 42.5): body depth 34.6; head length 40.7; eye diameter 10.8; snout length 9.6; bony interorbital width 8.2; upper jaw length 19.8; caudal peduncle depth unknown; caudal peduncle length 27.5; first dorsal-fin spine length 10.6; second dorsal-fin spine length 17.4; third dorsal-fin spine length 15.3; fourth dorsal-fin spine length 12.5; spine in second dorsal fin 12.5; first anal-fin spine length 2.8; second anal-fin spine length 12.0; pectoral fin length 22.8; pelvic fin length 22.1.

Dorsal fin VI-I,9; anal fin II,8; pectoral fin-rays 14 (right), 15 (left); pelvic fin I,5; principal caudal fin-rays 9+8; pored lateral line scales 24; transverse scale rows above lateral line 2; transverse scale rows below lateral line 5; median predorsal scales unknown; circumpeduncular scale rows unknown; gill rakers 22 on first arch, well developed gill rakers 21, (1+4 upper, 17+0 lower).

Villiform teeth in many rows on the premaxilla; one to two rows of villiform teeth on the sides of the dentary; two to three teeth on the palatine and one row on the vomer; none on ectopterygoid, endopteygoid or basihyal.

Supramaxilla absent. Posttemporal smooth to crenulate on posterior margin. Preopercle serrate on vertical and horizontal margins. Infraorbitals smooth. Scales ctenoid on body. Pored lateral-line scales extend from posttemporal to caudal fin. Vertebrate 10+14. Three supraneural bones, a single supranumerary spine on the first pterygiophore. Three epurals, 5 hypurals and one pair of uroneurals.

Anal opening close to the origin of the anal fin. Caudal fin-rays broken.

Life colors.—Unknown.

Preserved color pattern.—Body, head and fins generally uniform light grayish with no indication of any dark melanophore patterns. Stomach and intestine black, peritoneum speckled with melanophores. Anal area pale, speckled with a few melanophores.

Distribution.—Known from Batangas Province, Balayan Bay, south of Barrio Nonong Casto, in 146–155 meters by trawl.

Etymology.—The Greek noun bryx, in apposition, meaning depth of the sea in reference to the relatively deep water from which this cardinalfish was collected.

Remarks.—*Apogon bryx* has six first dorsal spines, an uncommon number for nominal species of *Apogon* with a completely serrated preopercle edge, eight anal rays, pored lateral-line scales from the posttemporal to caudal fin, and a black stomach and/or intestine. *Apogon thermalis* Cuvier, 1829, *Apogon sangiensis* Bleeker, 1857, *Apogon kiensis* Jordan & Snyder, 1901b, a new species related to *Apogon kiensis*, *Apogon gularis* Fraser & Lachner, 1984, *Apogon smithvanizi* Allen & Randall, 1994, *Apogon nanus* Allen et al., 1994, and an-

other new species have this combination of characteristics.

Apogon thermalis differs from *Apogon bryx* in having a dark head stripe and basicaudal spot and a deeper body depth (36–39%). The type specimens of *Apogon thermalis* from Sri Lanka and *Apogon sangiensis* from Indonesia have in common six first dorsal spines, serrated preopercular margins, 14 pectoral fin-rays, smooth posttemporal edges and similar gill raker counts (2+4–16+0 for *A. thermalis* and 2+4–15+3 for *A. sangiensis*). The type of *Apogon thermalis* has a dark snout mark continuing behind the eye, ending at the posterior edge of the opercle and a small, centered on the lateral line, basicaudal spot. The type of *Apogon sangiensis* has no remaining color pattern, however Bleeker (1857) provided a good color description of the type and a follow up color figure in the Atlas (Bleeker, 1873–76: pl. XLI, fig. 4). The color pattern appears very similar to *Apogon thermalis*. Both types are soft with poor body shapes and the type of *Apogon sangiensis* lack the premaxilla, so body proportions are of limited use for type comparisons. Based on the above information and examination of other material from the Indian Ocean and West Pacific Ocean, *Apogon sangiensis* is considered a synonym of *Apogon thermalis*.

Apogon kiensis has two stripes on the body, a snout mark, usually 15 pectoral fin-rays and 19–22 (16–18 well developed) gill rakers. The material from Mozambique identified by Smith (1961) as *Apogon kiensis* is an undescribed species having a third, shorter, stripe between the two stripes, usually 14 pectoral fin-rays and 22–25 (21–22 well developed) gill rakers. Both species differ from *Apogon bryx* in preserved color pattern. The undescribed African species has similar pectoral fin-ray and gill raker counts with the new species.

Apogon gularis has the anus near the pelvic fins unlike any other known species of *Apogon*. In the original description, *Apogon smithvanizi* was compared with *Apogon kiensis* but not with *Apogon gularis*. In addition to having similar preserved color patterns (a dark snout mark, a small spots behind the eye, generally pale body and fins) and body proportions, *Apogon gularis* and *Apogon smithvanizi* have in common: the anus in a forward position near the pelvic fin, black stomach and intestine, usually 14 pectoral fin-rays, six first dorsal spines, a serrated preopercular margin, and 23–26 (20–24 well developed) gill rakers. Both nominal species have been taken only from trawls in deeper waters, 30–40 m for *Apogon smithvanizi* and 60–290 m for *Apogon gularis*. No differences of substance were found. *Apogon smithvanizi* is treated here as a synonym of *Apogon gularis*.

Apogon nanus is a small, slender species with more gill-rakers on the first arch (28–29) than *Apogon bryx*, a dark spot on the tip of the lower jaw, a narrow dark band along the base of the anal fin and 13 pectoral fin-rays.

Apogon sp. has basicaudal and opercular spots, dark bars or saddles under each dorsal fin and 15–16 pectoral fin-rays, clearly different from *Apogon bryx*. *Apogon* sp. will be described by J. E. Randall and this author as part of their review of *Apogon trimaculatus* and *Apogon rhodopterus*.

Artificial key for preserved material of *Apogon* from the Indo-West Pacific region with six first dorsal spines, black stomach and intestine

1. Pored lateral-line scales from posttemporal to caudal fin 3
1′. Pored lateral-line scales incomplete, ending before origin of second dorsal fin, remaining scales of lateral line with pits. (*Brephamia*) (West Pacific Ocean) 2
2. Dark basicaudal spot present; no stripes on body. (West Pacific Ocean) ..... *Apogon neotes* Allen et al., 1994
2′. No dark basicaudal spot; stripes on body. (West Pacific Ocean) ..... *Apogon parvulus* .. (Smith & Radcliffe *in* Radcliffe, 1912)

3. Anal opening near origin of anal fin .. 4
3′. Anal opening near posterior base of pelvic fins. (Indo-West Pacific Ocean) ... *Apogon gularis* Fraser & Lachner, 1984
4. Ventral part of preopercle an unossified moveable flap 5
4′. Ventral part of preopercle ossified and edge serrate 7
5. Preopercular ridge smooth (*Zapogon*) 6
5′. Preopercular ridge serrate. (West Pacific Ocean) ..... *Apogon unicolor* Döderlein in Jordan & Snyder, 1901
6. Scales above and below lateral-line scales about the same size. (Red Sea) ... *Apogon isus* Randall & Böhlke, 1981
6′. Scales in rows above lateral-line scales much smaller, more than 35. (Atlantic, Indian and Pacific Oceans) ..... *Apogon evermanni* Jordan & Snyder, 1904
7. Nine anal fin-rays 8
7′. Eight anal fin-rays 12
8. Dark stripes on sides of body. (West Pacific Ocean). ..... *Apogon compressus* (Smith & Radcliffe *in* Radcliffe, 1911)
8′. No dark stripes on sides of body (*Zoramia*). (Indo-West Pacific Ocean) ... 9
9. Dark line on dorsum from origin of first dorsal fin onto caudal peduncle; ventral margin of caudal peduncle with dark line. (Indo-West Pacific Ocean) ..... *Apogon leptacanthus* Bleeker, 1856
9′. No dark line on dorsum or on dorsal and ventral surfaces of the caudal peduncle 10
10. Gular area dark; vertical short dark lines just above insertion of some anal rays. (West Pacific Ocean) ..... *Apogon perlitus* Fraser & Lachner, 1985
10′. Gular area pale; no vertical lines above anal rays 11
11. Opercular flap with prominent to diffuse dark spot; caudal spot small with many diffuse melanophores on caudal peduncle. (West Pacific Ocean) .... *Apogon gilberti* (Jordan & Seale, 1905)
11′. No spot on opercular flap; caudal spot small, without diffuse melanophores on caudal peduncle. (Indo-West Pacific Ocean) .... *Apogon fragilis* Smith, 1961
12. Gill-rakers 19–25; 14–16 pectoral rays 13
12′. Gill-rakers 28–29; 13 pectoral fin rays. (West Pacific Ocean) .... *Apogon nanus* Allen et al., 1994
13. Body and/or head with dark marks or stripes 14
13′. Body and head without dark marks or stripes. (West Pacific Ocean) .... *Apogon bryx*, new species
14. Body with dark stripes; no dark basicaudal spot 16
14′. No dark body stripes; dark basicaudal spot 15
15. Dark opercular spot; dark saddle under each dorsal fin; 15–16 pectoral rays. (West Pacific) ..... *Apogon* sp.
15′. No dark opercle spot; dark stripe from snout ending on opercle; 14 pectoral rays. (Indo-West Pacific Ocean) .... *Apogon thermalis* Cuvier *in* Cuvier & Valenciennes, 1829
16. Two stripes, one over the eye to posterior base of second dorsal fin, second from snout to end of caudal fin; 16–18 well developed gill rakers; usually 15 pectoral fin rays. (Indo-West Pacific Ocean) .... *Apogon kiensis* Jordan & Snyder, 1901
16′. Three stripes, one over the eye reaching on to caudal peduncle, a second from over the eye just above the broader, mid-lateral stripe from snout to tip of caudal fin; 21–22 well developed gill rakers; usually 14 pectoral fin rays. (West Indian Ocean) ... *Apogon* sp.

There is no obvious evidence, in the form of external damage, to suggest that an additional small first dorsal spine was present in the material of *Apogon bryx*. The x-rays provided no internal evidence of an articulation or support zone for an additional small first dorsal spine (two supranumerary spines instead of one). All of the other species with six first dorsal spines discussed here have only one supranumerary spine on the first pterygiophore. The only deep water (from 83 meters), seven-spined species from the Philippines with gill raker counts greater than 20 is *Apogon atrogaster* (Smith & Radcliffe *in* Radcliffe 1912) with 26–27 (24 well developed) gillrakers. It has a dark snout mark. Several of the paratypes appear to have six first dorsal spines (Fraser & Lachner 1984). At least one of these paratypes (41.0 mm SL)

has a lower gill raker count (2+5–17+0 = 24) within an expected possible range of variation for *Apogon bryx*. Three other specimens are too badly damaged to obtain counts. None of this paratypic material can be identified with any certainty by me.

Apogon bryx may be more similar to the undescribed western Indian Ocean species than any of the other species mentioned, based on body shape, pectoral fin-ray and gill raker counts. These two species and *Apogon kiensis* need to be examined for possible relationships with the *Apogon quadrifasicatus* complex, all species with seven first dorsal spines.

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